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N 536 - Utilization of Nursing Research in Advanced Practice, Summer 2008

Tzeng, Huey-Ming

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Research Design

Contributors
Sonia A. Duffy, PhD, RN
Lisa Kane Low, PhD, CNM, FACNM
Huey-Ming Tzeng, PhD, RN
Design Characteristics

- Maximizes control over factors to increase the validity of the findings
- Guides the researcher in planning and implementing a study
### Level of Control: Quantitative Research

- Descriptive
- Correlational
- Quasi-experimental
- Experimental

*Increased Control with Design*
Concepts Relevant to Research Design (1)

**Causality**
- A \( \rightarrow \) B
- Pressure \( \rightarrow \) Ulcer

**Multicausality**
- Years smoking \( \rightarrow \) Heart disease
- High fat diet \( \rightarrow \) Heart disease
- Limited exercise \( \rightarrow \) Heart disease
Concepts Relevant to Research Design (2)

- Probability: Likelihood of an outcome
- Bias: Slanting findings
- Manipulation: Treatment
- Control: All phases of design
Design Validity

• Measure of accuracy of a study

• Examined with critique of the following dimensions:
  o Statistical conclusion validity
  o Internal validity
  o Construct validity
  o External validity
Elements of a Strong Research Design (1)

- Controlling the environment of the study setting

- Levels of controlling:
  - Natural setting
  - Partially controlled setting: e.g., clinics
  - Highly controlled setting: e.g., laboratory
Elements of a Strong Research Design (2)

- Controlling the equivalence of subjects and groups
  - Random subject selection
  - Random assignment to groups
Elements of a Strong Research Design (3)

- **Controlling the treatment**
  - Choose a treatment based on research and practice
  - Develop a protocol for implementation
  - Document the implemented treatment
  - Use a check-list to determine the extent of completeness to which the treatment was implemented
  - Evaluate the treatment during the study
Elements of a Strong Research Design (4)

- Controlling measurement
  - Reliability
  - Validity
  - Number of measurement methods
  - Types of instruments
Elements of a Strong Research Design (5)

- Controlling extraneous variables
  - Identify and eliminate extraneous variables via sample criteria, choice of settings, or research design
  - Random sampling
  - Sample: Heterogenous, homogeneous, or matching
  - Statistical control
Problems with Study Designs

- Inappropriate for the study purpose or the research framework
- Poorly developed designs
- The research methods were poorly implemented
- Inadequate treatment, sample, or measurement methods
Selecting a Design

1. Is there a treatment?
   - No
   - Yes

   Is the primary purpose examination of relationships?
   - No
   - Yes

   Descriptive Design
   - Will the sample be studied as a single group?
     - No
     - Yes

     Correlational Design
   - No
   - Yes

   Quasi-Experimental Study
   - Will a randomly assigned control group be used?
     - No
     - Yes

     Is the original sample randomly selected?
     - No
     - Yes

   Experimental Study
Selecting a Descriptive Design

Examining sequences across time?

- No
  - One Group?
    - No
      - Comparative Descriptive Design
    - Yes
      - Descriptive Design

- Yes
  - Following same subjects across time?
    - No
      - Data collected across time
        - Yes
          - Longitudinal Study
        - No
          - Cross-sectional design
    - Yes
      - Studying events partitioned across time?
        - No
          - Trend Analysis
        - Yes
          - Repeated measures of each subject
            - Yes
              - Case Study
            - No
              - Longitudinal design with treatment partitioning

A Comparative Descriptive Design

Group I {variables measured} → Describe → Comparison of Groups on Selected Variables → Interpretation of Meaning

Group II {variables measured} → Describe → Development of Hypotheses
Selecting the Type of Correlational Design

Describe relationships between/among variables?

- Descriptive correlational design

Predict relationships between/among variables?

- Predictive correlational design

Test theoretically proposed Relationships?

- Model testing design
A Descriptive Correlational Design

Measurement

Research Variable 1

Description of variable

Examination of Relationship

Interpretation of Meaning

Development of Hypotheses

Research Variable 2

Description of variable
A Predictive Design

Value of Intercept + Value of Independent Variable 1 + Value of Independent Variable 2 = Predicted Value of Dependent Variable
Selecting The Type of Quasi-Experimental Design

Diagram:
- Control Group?
  - No
  - Pretest?
    - No
      - One-group post-test only design
    - Yes
      - Repeated Measures?
        - No
          - Strategy for Comparison
            - No
              - Suggest Reevaluating design
            - Yes
              - Compare treatment & control conditions?
        - Yes
          - Repeated Measures?
Selecting The Type of Experimental Design

Pretest
No
Post-test only control group design

Yes
Repeated Measurements?
No
Examine effects of confounding variables?
No
Multiple sites?
Pretest/post-test control group design

Yes
Repeated measures design

Yes
Blocking?
No
Comparison of multiple levels of treatment

Yes
Randomized Block Design

No
Examination of complex relationships among variables in relation to treatment

Yes
Nested Designs
### Pretest-Post Test, Control Group Designs

<table>
<thead>
<tr>
<th>Randomly selected experimental group</th>
<th>Measurement of dependent variables</th>
<th>Manipulation of independent variables</th>
<th>Measurement of dependent variables</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PRETEST</strong></td>
<td></td>
<td><strong>TREATMENT</strong></td>
<td><strong>POST-TEST</strong></td>
</tr>
</tbody>
</table>

| Randomly selected control group     | **PRETEST**                       | **POST-TEST**                        |

- **Treatment:** Under control of researcher
- **Findings:**
  - Comparison of pretest and post-test scores
  - Comparison of experimental and control groups
  - Comparison of pretest-post-test differences between samples
- **Example:** Your self (1990). The impact of group reminiscence counseling on a depressed elderly population.
- **Uncontrolled threats to validity:**
  - Testing
  - Mortality
- **Instrumentation**
  - Restricted generalizability as control increases
**Post-Test-Only Control Group Design**

<table>
<thead>
<tr>
<th>Measurement of independent variables</th>
<th>Measurement of dependent variables</th>
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</thead>
<tbody>
<tr>
<td>Randomly selected experimental group</td>
<td>TREATMENT</td>
</tr>
<tr>
<td>Randomly selected control group</td>
<td></td>
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</tbody>
</table>

**Treatment:** Under control of researcher

**Findings:** Comparison of experimental and control groups


**Uncontrolled threats to validity:**
- Instrumentation
- Mortality
- Limited generalizability as control increases
## Nested Design

### Pain Control Management

<table>
<thead>
<tr>
<th>Traditional care</th>
<th>PRN Medication</th>
<th>New approach: “Around the clock” medication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit A</td>
<td>Unit B</td>
<td>Unit E</td>
</tr>
<tr>
<td>Unit B</td>
<td>Unit C</td>
<td>Unit F</td>
</tr>
<tr>
<td>Unit C</td>
<td>Unit D</td>
<td>Unit G</td>
</tr>
<tr>
<td>Unit D</td>
<td></td>
<td>Unit H</td>
</tr>
</tbody>
</table>

### Primary Nursing Care

<table>
<thead>
<tr>
<th>Primary Care</th>
<th>No Primary Care</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit A</td>
<td>Unit B</td>
</tr>
<tr>
<td>Unit C</td>
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</table>

Research Design
Advantages of Experimental Designs

- More controls in design and conducting a study
- Increased internally validity
  - Decreased threats to design validity
- Fewer rival hypotheses
Advantages of Quasi-Experimental Designs

- More practical
  - Ease of implementation
- More feasible
  - Resources, subjects, time, setting
- More generalizable
  - Comparable to practice
Developing the Design Section of Your Proposal

- Identify the design
  - Name it specifically

- Provide a map of the design
- Discuss your rationale for using this design
- Describe threats to the validity of the chosen design